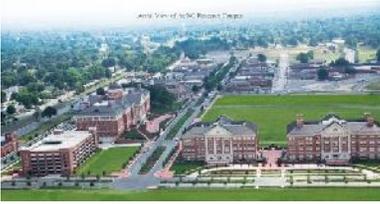




The NC Research Campus

The North Carolina Research Campus (NCRC) in Kannapolis, just north of Charlotte, is a public-private partnership made possible by the investment of David H. Murdock, owner of Dole Food Company, Inc., and Castle & Cooke, Inc., and the



state of North Carolina. David H. Murdock invested over \$600 million in the NCRC, including over \$130 million in the not-for-profit David H. Murdock Research Institute (DHMRI), which houses one of the largest collections of advanced scientific instrumentation in the world. For the people of North Carolina, the NCRC transformed a 350-acre site from a shuttered textile mill into a thriving life science research center that is home to 19 corporate, academic and healthcare partners that jointly share a mission to improve human health, agriculture and nutrition.

Employment

The seven UNC schools at the NCRC- UNC-Chapel Hill, NC State, UNC Charlotte, NCA&T, NC Central, UNC Greensboro and Appalachian State University- have created 151 new local jobs and supported more than 130 interns from high school through graduate level. The UNC schools have also collectively brought in more than \$43 million in grant funding through the end of FY13. The combined employment of the campus partners is close to 1,000 people. Fifty percent of these employees were locally hired while the rest have relocated from other states and countries.

On Campus

Since 2006, over one million square feet of wet lab and Class A office space have been built on the NCRC in the:

- David H. Murdock Core Laboratory Building
- NC State University Plants for Human Health Institute (PHHI)
- UNC Chapel Hill Nutrition Research Institute
- Rowan-Cabarrus Biotechnology Training Center,
- LabCorp Biorepository
- Cabarrus Health Alliance
- NCRC Medical Plaza.
- PHHI greenhouse complex

In 2014, two buildings will be under construction, the 50,000-square-foot DataChambers data center and the 110,000-square-foot city of Kannapolis municipal center.

David H. Murdock Core Laboratory Building



The 311,000-square-foot David H. Murdock Core Laboratory is the centerpiece of the NC Research Campus. The core laboratory is home to the David H. Murdock Research Institute (DHMRI), UNC Charlotte Bioinformatics Services Division, General Mills and Monsanto. General Mills and Carolinas Medical Center have expanded into the first suit of ready-to-go laboratories along with JC Med, LLC, a biotech start-up that develops and manufactures products to reduce insulin resistance. Two additional ready-to-go laboratory suites are under construction. Shell space is also available for construction of customized laboratory and office spaces.

Core Laboratory Background

Building:

- The ground breaking ceremony was in February 2006.
- The core laboratory building is built on the site of the former Cannon Mills Lake.
- Total construction costs exceeded \$100 million.
- The bricks used to build the core laboratory were delivered by rail from David Murdock's brick factory in Nebraska, USA.
- Yellow is Mr. Murdock's favorite color, which is why it is used throughout the core laboratory. The shade is called Murdock Yellow and can be purchased at Sherwin Williams.

Atrium:

- The marble floor in the entryway of the core laboratory building was personally picked by David Murdock. Over 250,000 pounds was imported from Carrera, Italy.
- The walls and the floor are of Calacata Gold Marble.
- The table at the center of the atrium is made from a Koa tree, an endangered species native to Hawaii.
- The tree fell on property of David Murdock's due to natural causes.
- He had furniture made from it, including the table atrium table.

Dome:

- The dome in the atrium is from 19 feet high and 38 feet in diameter and covers 2,500 square feet. From the atrium floor to the top of the dome is 154 feet.
- The dome was painted by Brenda Council from Blowing Rock, NC with the assistance of Thibault Tosseram, a German-French artist. The artists worked 12 to 15 hours days, seven days a week for two months.
- The artists climbed up scaffolding that was built from the atrium floor to a platform at dome-level.
- It is the largest painted dome in the Southeast. The lettuce alone is 11 feet long, and the pineapple is 18 feet long.
- Mr. Murdock signed a lemon in green paint.



David H. Murdock Research Institute

The David H. Murdock Research Institute (DHMRI) is a non-profit research organization established by David H. Murdock to support the scientists on the NC Research Campus and serve as a contract research organization for large and small pharmaceutical, biotech and agricultural companies as well as academic, non-profit and government organizations.

The DHMRI houses unparalleled scientific expertise and advanced instrumentation in:



- Genomics
- Proteomics
- Metabolomics
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Microscopy
- In vitro/in vivo Analytical Sciences
- Bioinformatics

Campus Research Centers and Partners

The DHMRI is just one of 19 research centers and partners at the NC Research Campus that include:

- Appalachian State University Human Performance Laboratory
- Cabarrus Health Alliance
- Carolinas Healthcare System
- City of Kannapolis
- DataChambers
- Dole Nutrition Research Laboratory
- Duke University/MURDOCK Study
- General Mills
- JC Med, LLC
- LabCorp Biorepository
- Monsanto
- NCA&T State University Center for Excellence in Post-Harvest Technologies
- NC Central University Nutrition Research Program
- NC State University Plants for Human Health Institute
- Rowan-Cabarrus Community College Biotechnology Training Center
- Sensory Discovery Center
- UNC Chapel Hill Nutrition Research Institute
- UNC Charlotte Bioinformatics Services Division
- UNC Greensboro Center for Translational Biomedical Research

Examples of Scientific Findings from the NC Research Campus

Appalachian State University Human Performance Laboratory



Over-the-counter joint supplement made from natural compounds proves relief of joint pain, providing credible scientific research for consumers in need of joint supplements. UNC Charlotte Bioinformatics Research Division contributed to the study. *Nutrition Journal*, November 2013

Proved that after a period of intense workouts, long-distance runners experienced more muscle damage, soreness and inflammation than cyclists. *Brain, Behavior and Immunity*, September 2013.

Six weeks of diet and exercise induced weight loss in obese children and lowered their blood pressure, cholesterol, insulin resistance and other risk factors for metabolic diseases like diabetes. *Journal of Sport and Health Science*, December 2013.

In collaboration with Dole Foods and NC State University Plants for Human Health Institute, clear evidence discovered of an alternate route of bioavailability and a 14-hour afterburn effect from a combination of polyphenols and exercise. *PlosOne*, August 15, 2013

Cabarrus Health Alliance



Experience with successful state and national accreditations. *Journal of Public Health Management and Practice*, January-February 2014.

Healthy Lives, Healthy Futures program, a wellness program designed to reduce the risk of chronic diseases such as diabetes and heart disease. *North Carolina Medical Journal*, November-December 2012.

Lessons learned from building a culture and infrastructure for continuous quality improvement. *Journal of Public Health Management and Practice*, January-February 2012.

General Mills



A new genetic linkage map of barley (*Hordeum vulgare* L.) *Field Crop Research*, August 23, 2013.

SNP discovery and chromosome anchoring provide the first physically-anchored hexaploid oat map. *PloS One*. March 22, 2013.

Dole Foods Nutrition Research Laboratory



Effects of a freeze-dried juice blend powder on exercise-induced inflammation, oxidative stress, and immune function in cyclists, with Appalachian State University Human Performance Laboratory and UNC Charlotte Bioinformatics Research Services Division. *Applied Physiology, Nutrition and Metabolism*, March 2014.

Vitamin D2 supplementation amplifies eccentric exercise-induced muscle damage in NASCAR pit crew athletes, with Appalachian State University Human Performance Laboratory. *Nutrients*, December 2013.

Serum metabolic signatures induced by a three-day intensified exercise period persist after 14 h of recovery in runners, with Appalachian State University Human Performance Laboratory and NC State University Plants for Human Health Institute. *Journal of Proteome Research*, October 2013.

The microbiota is essential for the generation of black tea theaflavins-derived metabolites, with the NC A&T Center for Excellence in Post-Harvest Technologies.

Duke University/MURDOCK Study



The Southern Diabetes Initiative is establishing new methods to treat and prevent complications of type 2 diabetes employing a team approach to support patients' lifestyle changes as well as geo-spatial mapping to better identify at-risk populations. Duke Translational Medical Institute and the Centers for Medicare and Medicaid, May, 2012.

The Measurement to Understand Reclassification of Disease of Cabarrus/Kannapolis (MURDOCK) Study is a multi-tiered, longitudinal study designed to enable classification of chronic diseases using clinically annotated biospecimen collections, -omic technologies, electronic health records, and standard epidemiological methods. *American Journal of Translational Research*, October 2012.

The MURDOCK Study embodies a new model of team science investigation and represents a significant resource for translational research. *American Journal of Translational Research*, August 2012.

Baseline metabolomic profiles predict cardiovascular events in patients at risk for coronary artery disease. *American Heart Journal*, May 2012.

NC A&T State University Center for Excellence in Post-Harvest Technologies



Demonstrated in an animal model that the polyphenols in peanut skins, specifically A-type procyanidin, can lower lipid (fat) levels in the blood. Lipid levels correlate directly to the incidence of cardiovascular disease. *Food Chemistry*, October 2013.

Shogaols, a series of major constituents in dried ginger (*Zingiber officinale*), show high anticancer potencies. *Chemical Research in Toxicology*, June 2013.

Microfluidization increases antioxidant capacity of native wheat bran. *Journal of Cereal Science*, November 2013.

NC Central University Nutrition Research Program



In collaboration with NC A&T found using a zebrafish model that 10-gingerol, a natural compound in ginger, is a potential treatment to prevent anemia caused by chemotherapy or renal disease. *Journal of Agricultural and Food Chemistry*, June 2013.

Provided fundamental support for developing metformin-mediated preventive strategies targeting erbB-2-associated carcinogenesis (breast cancer). *Cancer Prevention Research*, December 2013.

Identified SNDX-275 (undergoing clinical trials for treatment of several cancers) enhanced trastuzumab (Herceptin) efficacy against erbB2-overexpressing breast cancer cells, and exhibited potential to overcome trastuzumab resistance. *Cancer Letters*, August 2011.

NC State University Plants for Human Health Institute



Found that anthocyanin- and proanthocyanidin-rich extracts from blueberries and grape seeds have neuroprotective effects in cellular models of Parkinson s disease. *Brain Research*, March 2014.

Phytochemical changes in phenolics, anthocyanins, ascorbic acid, and carotenoids associated with sweetpotato storage and impacts on bioactive properties. *Food Chemistry*, February 2014.

Optimized a method to extract polyphenols from cranberry pomace (seeds, skins and stems of the cranberry) and co-dried them with a soy protein isolate creating the potential for a new food ingredient that is stable and high in polyphenolic content. *Food Chemistry*, December 2013.

Found a novel genetic marker that can be useful for tomato breeders to screen progeny when segregating populations for ToMV resistance to protect crops from the tomato mosaic virus. *Plant Breeding*, May 2013.

UNC-Charlotte



Analysis and identification of genes that represent a robust set of cytokinin-responsive genes that are useful in the analysis of cytokinin function in plants (control of cell division relate to the growth of roots and shoots.) *Plant Physiology*, May 2013.

Developed a bioinformatics, software to integrate and visualize pathway-based data. *Bioinformatics*, July 2013.

An introduction to the fields of genomics, bioinformatics, and proteomics using the blueberry genome as a model case study of the plant genomics field. *Frontiers in Genetics*, November 2013.

Identified a set of genes previously not implicated in the oxidative stress, a well-known biological process that is involved in pathophysiological processes such as aging and apoptosis. *Plos One*, September 2013.

UNC-Chapel Hill Nutrition Research Institute



Importance of choline in the diet of pregnant women either through food or dietary supplements to ensure optimal maternal liver and placental function and fetal development. *International Journal of Women's Health*, April 2013.

Measurement, empirical identification and correlation of specific childhood outcomes and Fetal Alcohol Spectrum Disorders. *Drug and Alcohol Dependence*, December 2013.

Omega-6 to omega-3 fatty acid ratio and higher-order cognitive functions in 7- to 9-year-olds: a cross-sectional study. *American Journal of Clinical Nutrition*, September 2013.

Genetic signatures in choline and 1-carbon metabolism are associated with the severity of hepatic steatosis (fatty liver). *FASEB Journal: Official Publication of the Federation of American Societies for Experimental Biology*, April 2013.

UNC Greensboro Center Biomedical Translational Research



In collaboration with UNC Charlotte Bioinformatics Research Division, increased plasma corticosterone contributes to the development of alcoholic fatty liver. *American Journal of Physiology. Gastrointestinal and Live Physiology*, December 2013.

First proof that dietary zinc deficiency is a risk factor in the development of alcoholic liver disease. *PLoS One*, October 2013.

Elevated Asymmetric dimethylarginine (ADMA) in colon cancer patients may contribute to the blocking of apoptosis (cell death) of cancer cells in response to stress and chemotherapy. *Cell Death and Disease*, October 2013.

Improved understanding of the systemic modulations of bile acid metabolism in mammals through the gut-liver axis when exposed to alcohol consumption. *FASEB Journal: Official Publication of the Federation of American Societies for Experimental Biology*. September 2013.

For more information about the NCRC, visit www.ncresearchcampus.net and sign-up for e-newsletters or follow the campus on Facebook, Twitter or LinkedIn.